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Energy transfer from paramagnetic ions to a lattice through rapidly relaxing centers

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Abstract

Spin-lattice relaxation is analyzed in a crystal containing two types of paramagnetic centers having approximately equal resonant frequencies but markedly different spin-phonon couplings. It is assumed that for the centers having the strong spin-phonon coupling this coupling is stronger than the spin-spin coupling with other paramagnetic centers. The Green's function method is used. The spin-lattice relaxation time for the centers coupled weakly with the lattice through rapidly relaxing centers is found as a function of the difference between the splittings of their spin levels, the strength of the spin-spin coupling between these centers, the concentrations of these centers, and the strength of the spin-phonon coupling over rapidly relaxing centers.

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